

EXERCISES

For more practice, see *Extra Practice*.

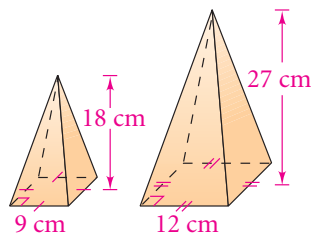
Practice and Problem Solving

A Practice by Example

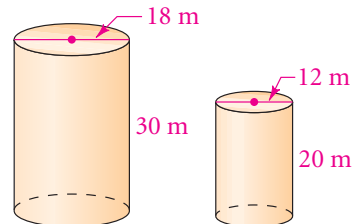
Example 1
(page 566)

Are the two figures similar? If so, give the similarity ratio.

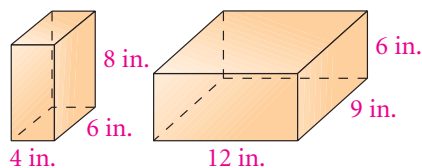
1.



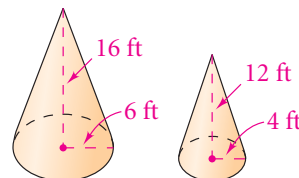
2.



3.



4.



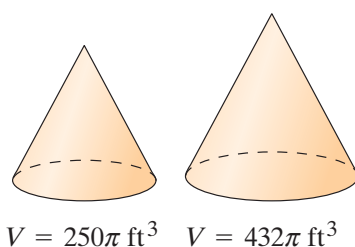
5. two cubes, one with 3-cm edges, the other with 4.5-cm edges

6. a cylinder and a square prism each with 3-in. radii and 1-in. heights

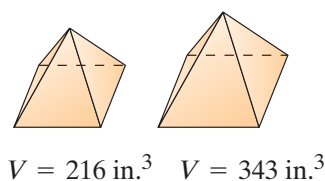
Example 2
(page 567)

Each pair of figures is similar. Use the given information to find the similarity ratio of the smaller figure to the larger figure.

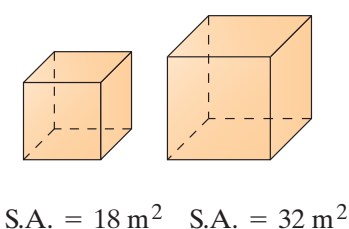
7.



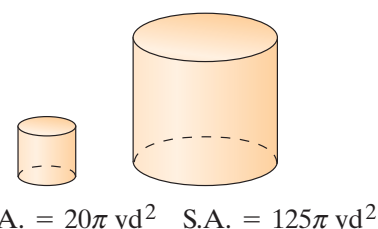
8.



9.



10.



Example 3
(page 567)

The surface areas of two similar figures are given. The volume of the larger figure is given. Find the volume of the smaller figure.

11. S.A. = 18 in.²
S.A. = 98 in.²
V = 343 in.³

12. S.A. = 192 m²
S.A. = 1728 m²
V = 4860 m³

13. S.A. = 52 ft²
S.A. = 208 ft²
V = 192 ft³

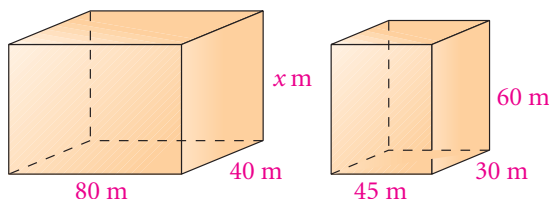
The volumes of two similar figures are given. The surface area of the smaller figure is given. Find the surface area of the larger figure.

14. V = 27 in.³
V = 125 in.³
S.A. = 63 in.²

15. V = 5 m³
V = 40 m³
S.A. = 4 m²

16. V = 54 yd³
V = 128 yd³
S.A. = 18 yd²

- 17. Packaging** There are 750 toothpicks in a regular-sized box. If a jumbo box is made by doubling all the dimensions of the regular-sized box, how many toothpicks will the jumbo box hold?
- 18. Packaging** A cylinder 4 in. in diameter and 6 in. high holds 1 lb of oatmeal. To the nearest ounce, how much oatmeal will a similar 10-in.-high cylinder hold? (*Hint:* 1 lb = 16 oz)
- 19.** A regular pentagonal solid prism has 9-cm base edges. A larger, similar solid prism of the same material has 36-cm base edges. How does each indicated measurement for the larger prism compare to the same measurement for the smaller prism?
 - a. the volume
 - b. the weight
- 20.** Two similar prisms have heights 4 cm and 10 cm.
 - a. What is their similarity ratio?
 - b. What is the ratio of their surface areas?
 - c. What is the ratio of their volumes?
- 21. Atomic Clock** A company announced that it had developed the technology to reduce the size of its atomic clock, which is used in electronic devices that transmit data. The company claims that the smaller clock will be similar to the existing clock made of the same material. It will be $\frac{1}{10}$ the size of its existing atomic clocks and $\frac{1}{100}$ the weight. Do these ratios make sense? Explain.
- 22.** Is there a value of x for which the rectangular prisms below are similar? Explain.



- Lesson 10-8 Areas and Volumes of Similar Solids 569

29. A clown's face on a balloon is 4 in. high when the balloon holds 108 in.^3 of air. How much air must the balloon hold for the face to be 8 in. high?

Copy and complete the table for the similar solids.

	Similarity Ratio	Ratio of Surface Areas	Ratio of Volumes
30.	1 : 2	■ : ■	■ : ■
31.	3 : 5	■ : ■	■ : ■
32.	■ : ■	49 : 81	■ : ■
33.	■ : ■	■ : ■	125 : 512

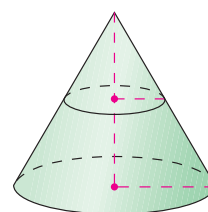
34. **Literature** In *Gulliver's Travels* by Jonathan Swift, Gulliver first traveled to Lilliput. The Lilliputian average height was one twelfth of Gulliver's height.
- How many Lilliputian coats could be made from the material in Gulliver's coat? (*Hint: Use the ratio of surface areas.*)
 - How many Lilliputian meals would be needed to make a meal for Gulliver? (*Hint: Use the ratio of volumes.*)

Challenge

35. **Indirect Reasoning** Some stories say that Paul Bunyan was ten times as tall as the average human. Assume that Paul Bunyan's bone structure was proportional to that of ordinary people.
- Strength of bones is proportional to the area of their cross section. How many times as strong as the average person's bones would Paul Bunyan's bones be?
 - Weights of objects made of like material are proportional to their volumes. How many times the average person's weight would Paul Bunyan's weight be?
 - Human leg bones can support about 6 times the average person's weight. Use your answers to parts (a) and (b) to explain why Paul Bunyan could not exist with a bone structure that was proportional to that of ordinary people.
36. Square pyramids *A* and *B* are similar. In pyramid *A*, each base edge is 12 cm. In pyramid *B*, each base edge is 3 cm and the volume is 6 cm^3 .
- Find the volume of pyramid *A*.
 - Find the ratio of the surface area of *A* to the surface area of *B*.
 - Find the surface area of each pyramid.



37. The cone is cut by a plane parallel to its base. The small cone on top is similar to the large cone. The ratio of the slant heights of the cones is 1 : 2. Find the ratio indicated.



- the surface area of the large cone to that of the small cone; the volume of the large cone to that of the small cone
- the surface area of the frustum to that of the large cone; to that of the small cone
- the volume of the frustum to that of the large cone; to that of the small cone



Need Help?

A frustum of a cone is defined on page 556.



Standardized Test Prep

Gridded Response

38. The slant heights of two similar pyramids are in the ratio 1 : 5. The volume of the smaller pyramid is 60 m^3 . What is the volume in cubic meters of the larger pyramid?
39. A lawn chair weighs 8 lb. A child's lawn chair has dimensions exactly one half those of the larger chair. How many pounds does the child's chair weigh?
40. A model of a historical home has dimensions that are one fifteenth the dimensions of the actual home. The area of a window in the model is 2 cm^2 . What is the area in square centimeters of the corresponding window in the actual home?
41. The volumes of two similar rectangular prisms are 64 cm^3 and 1000 cm^3 . The surface area of the smaller figure is 112 cm^2 . What is the surface area in square centimeters of the larger figure?
42. The surface areas of two similar cylinders are 54 ft^2 and 96 ft^2 . The volume of the smaller cylinder is 216 ft^3 . What is the volume in cubic feet of the larger cylinder?



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Mixed Review

Lesson 10-7

43. **Sports Equipment** The circumference of a regulation basketball is between 75 cm and 78 cm. What are the smallest and the largest surface areas that a basketball can have? Give your answers to the nearest whole unit.

Find the volume and surface area of each sphere to the nearest tenth.

44. diameter = 6 in. 45. circumference = $2.5\pi \text{ m}$ 46. radius = 6 in.

Lesson 8-4

47. The altitude to the hypotenuse of a right triangle ABC divides the hypotenuse into 12-mm and 16-mm segments. Find the length of each of the following.
- a. the altitude to the hypotenuse
 - b. the shorter leg of $\triangle ABC$
 - c. the longer leg of $\triangle ABC$

Lesson 8-1

Solve each proportion.

48. $\frac{25}{16} = \frac{x}{16}$

49. $\frac{21}{x} = \frac{8}{5}$

50. $\frac{3}{8} = \frac{n}{n+4}$